

Ex Parte)	In the 181 st District Court
)	Potter County, Texas
Ernest Lopez)	181 st Judicial District

Affidavit of Dr. Patrick D. Barnes

Patrick D. Barnes, being duly sworn, states as follows:

1. My name is Patrick D. Barnes, M.D. I am a pediatric neuroradiologist and am board certified in Diagnostic Radiology and Neuroradiology. I am a Professor of Radiology at Stanford University Medical Center and Chief of Pediatric Neuroradiology and Medical Director of the MRI/CT Center at Lucile Salter Packard Children's Center. I have practiced and taught on head injury in children for thirty years, and have published over a hundred articles, reviews and book chapters on this subject. My curriculum vita is attached as Exhibit 1.
2. Over the past decade, the differential diagnoses for radiological findings previously associated with non-accidental pediatric head trauma have greatly expanded and now include a variety of accidental and natural causes. The application of evidence-based medicine has further established that the research basis for shaken baby syndrome (SBS) and similar diagnoses is very limited, and some of the basic tenets of these diagnoses have been disproven by research in biomechanics, neuropathology and radiology. I am attaching two of my articles that address these issues. *Ethical Issues in Imaging Nonaccidental Injury: Child Abuse*, Topics in Magnetic Resonance Imaging 13(2):85-93 (2002) (Ex. 2); *Imaging of the Central Nervous System in Suspected or Alleged Non-accidental Injury, Including the Mimics*, Barnes & Krasnokutsky, Topics in Magnetic Resonance Imaging 18:53-74 (2007) (Ex. 3).
3. The opinions I express are held to a reasonable degree of medical certainty and are based on my clinical, teaching and research experience in pediatric head injury over the past thirty years.

Review of radiology

4. In this affidavit, I review the images for Isis Vas (DOB 4/26/00). The radiological findings are non-specific, *i.e.*, they may be attributable to a wide array of causes, including natural causes. Further determination of causation requires a differential diagnosis (identification of possible causations) supplemented by a complete review of the child's medical records and clinical history.
5. I have reviewed the following images:
 - October 28, 2000 CT scan (head) (6:57 p.m.)

- October 28, 2000 chest x-ray
 - October 29, 2000 chest x-ray
 - October 31, 2000 skeletal survey
6. CT Scan (head). The CT scan, which was taken approximately 7½ hours after hospital admission, shows a small thin hemorrhage covering the right hemisphere. The hemorrhage could be subdural, subarchnoid, intradural or intraventricular. On CT scan, these distinctions are difficult to make in children, whose membranes are thinner and whose vessels may leak when stressed. The hemorrhage is nonspecific for cause and would not explain the child's death. Similar hemorrhages are seen in 26-46% of asymptomatic newborns, with no ill effects.
 7. The hemorrhage is most likely 3 hours to 10 days old. When blood first escapes from a blood vessel, it appears dark on CT. When it clots (typically within 2-3 hours), it becomes bright. It then remains bright for 7-10 days. Dark areas may be very recent (less than 3 hours old) or much older (weeks to months old, or back to birth). This hemorrhage is bright, indicating that it likely occurred between 3 hours and 10 days prior to the CT scan.
 8. There is no intraparenchymal hemorrhage, *i.e.*, bleeding within the brain, and no indicators of trauma, such as skull fractures, contusions or shear injuries.
 9. There is diffuse, or widespread, edema in the brain. The ventricles and cisterns are virtually effaced by the swelling of the brain, but there is some grey/white matter differentiation, suggesting that the edema may be relatively recent. Edema may be secondary to other causes, including infection and lack of oxygen to the brain.
 10. The October 28, 2000 radiology report on the CT scan identifies a subarachnoid hemorrhage and diffuse cerebral edema with no intraparenchymal bleed or fractures. I can't tell from the CT scan whether this is a subarachnoid or some other type of intracranial hemorrhage, but I otherwise concur with this interpretation.
 11. MRIs provide more specific information on the location and timing of hemorrhages. Since no MRIs were taken, a complete medical and pathologic evaluation will be needed to help determine causation and timing.
 12. Oct. 28 chest x-ray. The chest x-ray taken approximately 1 hour after hospital admission shows no pleural effusions and a subacute fracture of the left clavicle. The callous in the area of the fracture suggests that it is at least 2-4 weeks old. There is some oddity, possible pneumonitis, in the upper chest area, but it is not possible to determine the cause on this x-ray.
 13. A radiology report dated October 28, 2000 notes pleural effusions but does not note the fracture. A re-read on October 3, 2006 notes a subacute fracture of the left clavicle and no pleural effusions. I agree with the second report on these points.

14. The October 2006 report states that “in conjunction with the patient’s head injuries, the findings are consistent with the presence of non-accidental trauma.” Clavicle fractures are, however, common accidental findings in children, and the CT findings are nonspecific and indicate lack of oxygen, with no specific indicators of trauma. The disparate timing suggests that these findings are unrelated.
15. Oct. 29 chest x-ray. The October 29 x-ray shows that pneumonia and pleural effusions have blossomed between October 28 and 29, suggesting advanced respiratory distress syndrome (ARDS). This can be associated with septic shock (infection), trauma, or lack of oxygen (hypoxia/ischemia). Although the first x-ray does not show pleural effusions, viral pneumonia cannot be ruled out since x-rays often lag behind the symptoms.
16. Skeletal survey. The skeletal survey shows no fractures or abnormalities other than the right clavicle fracture, which is at least 2-4 weeks old.

Differential diagnosis

17. Since 2000, the pediatric head injury literature has identified many causes for symptoms previously viewed as diagnostic of non-accidental head trauma. There is also greater awareness that children, individually and as a group, have different physiological characteristics that may render them particularly susceptible to hypoxia/ischemia and/or intracranial hemorrhage with minor trauma or no trauma.
18. A 2002 article by leading forensic pediatricians lists the differential diagnosis for findings previously viewed as diagnostic of SBS or inflicted head trauma as trauma (accidental or non-accidental); prenatal, perinatal and pregnancy-related conditions; birth trauma; metabolic, genetic, oncologic or infectious diseases; congenital malformations; autoimmune disorders; clotting disorders; medical or surgical interventions; the effects of drugs, poison or toxins; and other miscellaneous conditions. The authors note that many of these causes can be excluded or confirmed by careful history, physical examinations, radiological studies and/or laboratory testing. K. Hymel, C. Jenny, R. Block, *Intracranial Hemorrhage and Rebleeding in Suspected Victims of Abusive Head Trauma: Addressing the Forensic Controversies*, Child Maltreatment, Vol. 7, No. 4 (2002).
19. My 2002 article on pediatric head injury reached similar conclusions. Ex. 2 at 91 (differential diagnosis includes accidental injury, certain coagulopathies, vascular diseases, infectious, postinfectious or postvaccinal conditions, metabolic disorders, neoplastic diseases, certain therapies, and some congenital and dysplastic disorders). To diagnose nonaccidental trauma, the physician must rule out such conditions and consider combined or synergistic effects of two or more conditions.
20. My 2007 article, co-authored with Dr. Krasnokutsky, contains an expanded (six page) description of the differential diagnosis and further describes the parapsychoLOGY, which includes increased intracranial pressure, increased venous

pressure, systemic hypotension or hypertension, vascular fragility, hematologic derangement and/or collagenopathy, superimposed on immature CNS and other systems. Ex. 3 at 65-70. A 2006 text on abusive head trauma in infants and children also contains an excellent description of the differential diagnosis.

Sirotnak A., *Medical disorders that mimic abusive head trauma*, in Frasier et al, *Abusive Head Trauma in Infants and Children: A Medical, Legal, and Forensic Reference*, St. Louis, MO: GW Medical Publishing 2006 (chapter 14 at 191-226) (medical disorders that mimic abusive head trauma include prenatal, perinatal, and pregnancy related conditions; accidental trauma; genetic and metabolic disorders; hematological diseases and disorders of coagulation and clotting; infection; autoimmune and vaculitis conditions; oncological conditions; toxins, poisons and nutritional deficiencies; and medical and surgical complications). Many of these conditions cannot be identified through radiology or autopsy.

21. In this case, there are many differential diagnoses for the radiological findings. As indicated, clavicle fractures are relatively common accidental injuries, and the thin hemorrhage and cerebral edema are nonspecific for cause. Since there are no specific indicators of trauma, possible causes include hypoxia/ischemia (lack of oxygen), infection, impaired coagulopathy (bleeding disorder), metabolic disorder, increased venous pressure, dehydration, and/or resuscitative or post-admission treatment, either separately or in combination.
22. The timing does not suggest that the fracture and CT findings are related. The clavicle fracture is from a much earlier time period, at least 2-4 weeks prior to hospitalization. The small hemorrhage could have occurred anytime between 3 hours and 10 days prior to CT scan, and could be attributable to prior illness or post-admission procedures. The edema represents a loss of oxygen, consistent with the child's clinical picture and reported downtime prior to hospital resuscitation.

Correlation of radiology and other data.

23. Since the radiology findings are nonspecific, any analysis of causation and timing must include a careful review of the medical records and clinical history. In the absence of radiological findings that identify a specific cause, such as venous sinus thrombosis, the role of the radiologist is to identify possibilities and point out whether particular diagnoses are consistent or inconsistent with the radiology.
24. While I have not done a complete records review, I have reviewed the Court of Appeals August 2005 opinion, which summarizes the trial testimony; the lab reports; a few caretaker reports; and some hospital records. These materials suggest an array of natural or accidental causes for the radiology findings. For example:
 - a. *Court of Appeals decision.* The Court of Appeals decision describes various reported symptoms in the days before hospital admission, including raised dark looking bumps on the child's head attributed to spider bites; lethargy; fever; pre-existing bruises; black stool; failure to eat; and respiratory problems.

- b. *Laboratory reports.* Laboratory tests taken shortly after hospital admission confirm a bleeding disorder (PTT > 212). This is a highly abnormal finding that would explain any hemorrhages, including the hemorrhage noted on CT scan.
 - c. *Caretaker reports.* The caretakers report a sick or vulnerable child with multiple falls and possible weight loss during the period August to October 2000. In addition to the symptoms reported in the Court of Appeals opinion, there are reports of a short fall the night prior to hospital admission.
 - d. *Medications.* The child's illness was treated with antibiotics, albuterol and PediaCare, an infant cough and cold medicine that has been implicated in infant deaths and has since been removed from the shelves.
 - e. *Life support.* The child was resuscitated and kept on life support for approximately 60 hours for purposes of organ harvest.
25. Any of these factors may have produced the radiology findings. The clavicle fracture is consistent with an earlier fall, while the CT findings are consistent with illness or infection, impaired coagulopathy (bleeding disorder), inappropriate medications, hypoxia-ischemia, possible dehydration, an accidental fall the previous night, and/or post-admission resuscitation. There is no indication in the radiology or the material that I have reviewed indicating that the hemorrhage, edema or death were caused by non-accidental trauma.

Comments on medical testimony and reports

26. I have been asked to comment on the testimony and affidavits by Dr. Levy and Dr. McClain. I am limiting my comments to the radiology.
27. *Dr. Levy.* I agree with Dr. Levy that the clavicle fracture was an earlier injury. I do not agree that the CT scan shows traumatic injury and/or violent brain injury occurring within an hour of the 911 call. There is no specific evidence of traumatic injury or blunt force trauma on the CT scan. The small intracranial hemorrhage is a nonspecific finding that may be attributable to a variety of factors, including natural causes, occurring any time over a ten day period. The edema is consistent with hypoxia/ischemia, or lack of oxygen to the brain, and may be secondary to illness, infection or the downtime.
28. I do not agree that it requires violent shaking to cause the small hemorrhage and edema shown on the CT scan. While this theory was widely accepted in the late 1990s, including by my own practice, it is now understood that this theory is not evidence-based, and that there are many alternative causes for these findings, ranging from illness to metabolic disorders to short falls. The biomechanical studies further confirm that shaking is not a viable explanation for these findings, particularly in the absence of significant structural neck damage.

29. *Dr. McClain.* I agree with Dr. McClain that the fractured clavicle was unrelated to the death. I disagree that a subdural hemorrhage indicates trauma to the brain cells or brain cell damage. Relatively recent radiology studies have established that subdural hemorrhages of this nature are found in 26-46% of asymptomatic newborns. While I agree that edema indicates injury to the brain cells, this may be secondary to hypoxia/ischemia (lack of oxygen), rather than trauma.

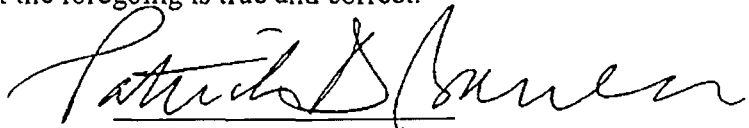
Medical consultation

30. I have been asked whether it would have been possible for the trial attorneys to address the medical issues without consulting medical experts. My answer is unequivocally no. In general, attorneys do not have sufficient medical expertise to understand the radiology or other medical findings. In this case, there was a great deal of relevant research going on during the period 2000-2003, and it would have required substantial expertise simply to keep up with the literature.
31. Even if the attorneys were able to interpret the radiology and other findings on their own, it would have been difficult to introduce this evidence at trial without experts. In general, cases of this nature require consultations and sometimes testimony in several specialties, including radiology, forensic pathology and neuropathology.

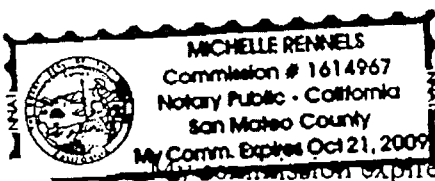
Conclusion

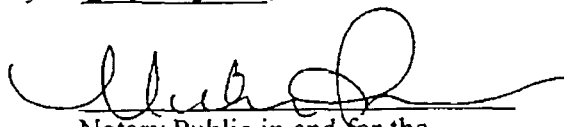
32. In this case, the radiology is nonspecific for cause and timing, and is consistent with natural and/or accidental causes.
33. If the Court or District Attorney would like further information on the developments in pediatric head injury, I am willing to provide an additional affidavit or testimony on this subject.

I swear under penalty of perjury that the foregoing is true and correct.


Patrick Barnes, M.D.

Subscribed and sworn to before me this 1st day of December, 2008.




Notary Public in and for the
State of California

My commission expires: 10-21-09